Effective June 1st, 2009
NEW Minnesota Energy Code
with RADON reduction features

State Energy Code only requires that a "passive" vent pipe be put in that allows for a radon mitigation system to be easily installed. Passive systems may not reduce radon levels in homes. HOMEOWNERS have to verify that radon levels in the home are acceptable by TESTING after construction is completed.

For more information on radon requirements in the code visit: www.bamn.org/energycode

MINNESOTA MDH DEPARTMENT OF HEALTH

GOLD STANDARD

The Minnesota Department of Health (MDH) is looking to partner with builders to install systems to the MDH Gold Standard. Building to the gold standard helps to reduce the risk that radon poses to Minnesota homeowners. MDH will market and promote those contractors who choose to partner with us.

While the code only requires a "passive" system the Gold Standard requires an "active" system. The difference between a "passive" and "active" system is the installation of an in-line fan. The code-required systems only offer a minimal reduction while the gold standard maximizes the radon reduction! Ensure that you and your clients are protected and that all your homes are below the Environmental Protection Agency (EPA) action level. Build to the MDH gold standard.

For More Information call: (651) 201-4601 or (800) 798-9050

MINNESOTA MDH DEPARTMENT OF HEALTH

Indoor Air Unit

GOLD STANDARD CHECK LIST

RADON MITIGATION SYTEM

- ☐ Radon Mitigation System installed according to IRC Appendix F
- ☐ No dirt crawl spaces
- ☐ Radon Vent Stack must be run through an interior wall or chase, not the exterior walls
- ☐ Design for sub-slab pressure extension
- ☐ Passive system MUST BE ACTIVATED
- ☐ Fan must be selected based on pressure extension and fan curve characteristics
- ☐ Ensure max depressurization will not cause back drafting of combustion appliances
- ☐ The short-term test shall be performed before closing
  Date: _____
  Level: _____
- ☐ Long-term test deployed at closing for a length of one year
  Date: _____
  Level: _____
- ☐ Follow up testing by occupant. Every 2 years or after building alteration

Follow-Up Testing

Test Date:	Level:	Test Date:	Level:

MINNESOTA MDH DEPARTMENT OF HEALTH

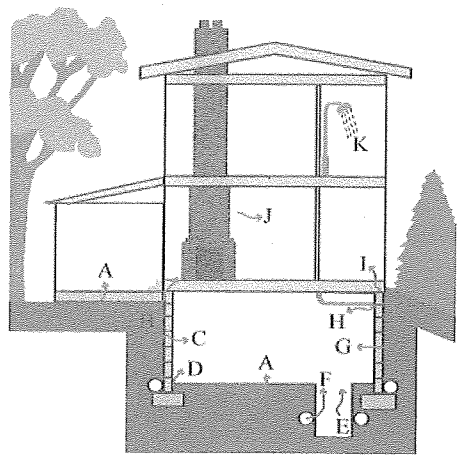
Indoor Air Unit

Gold Standard Radon Resistant New Construction Practices

Radon Health Effects:

- Radon is a radioactive gas that can enter a home, decay and attach to particles in the air that can be breathed into the lungs. As the radioactive particles break down further, they release bursts of energy which can damage the DNA in lung tissue leading to lung cancer.[1]
- Radon has been classified as a Group A or Class 1 carcinogen (known to cause cancer in humans). [2,3]
- The U.S. Environmental Protection Agency estimates that each year 21,000 people die of lung cancer as a result of being exposed to elevated levels of radon. [4]
- The evidence that radon causes lung cancer is extensive and based on: human data taken from studies of underground miners over a period of more then 50 years; human data from studies in residential settings; and biological and molecular studies.

1. Environmental Protection Agency (EPA) (2001) Building Radon Out, A Step-by-step Guide On How To Build Radon-Resistant Homes. USEPA: 402-K01-002
2. Report on Carcinogens (RoC), 11th Edition.
3. International Agency for Research on Cancer (IARC) (2001) Some internally deposited radionuclides. Vol 78.
4. EPA (2003) Assessment of Risks from Radon in Homes. Washington, DC, USEPA: 1-88.



How does radon enter your home?

MAJOR RADON ENTRY ROUTES

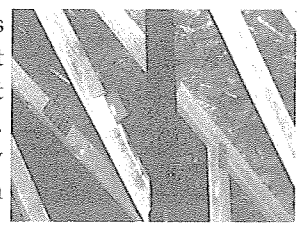
A. Cracks in concrete slabs.
B. Spaces behind brick veneer walls that rest on uncapped hollow-block foundations.
C. Pores and cracks in concrete blocks.
D. Floor-wall joints.
E. Exposed soil, as in a sump or crawl space.
F. Weeping (drain) tile, if drained to an open sump.
G. Mortar joints.
H. Loose fitting pipe penetrations.
I. Open tops of block walls.
J. Building materials, such as brick, concrete, rock.

Radon Risk If You've Never Smoked

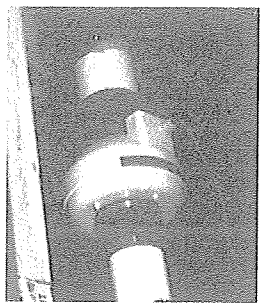
Radon Level	If 1,000 people who never smoked were exposed to this level over a lifetime*...	WHAT TO DO:
20 pCi/L	About 36 people could get lung cancer	Fix your home
10 pCi/L	About 18 people could get lung cancer	Fix your home
8 pCi/L	About 15 people could get lung cancer	Fix your home
4 pCi/L	About 7 people could get lung cancer	Fix your home
2 pCi/L	About 4 people could get lung cancer	Consider fixing between 2 and 4 pCi/L
1.3 pCi/L	About 2 people could get lung cancer	(Reducing radon levels below 2 pCi/L is difficult.)
0.4 pCi/L		

Note: If you are a former smoker, your risk may be higher.
pCi/L (pico Curies per Liter)
* Lifetime risk of lung cancer deaths from EPA Assessment of Risks from Radon in Homes (EPA 402-R-03-003).

Why Build to the MDH Gold Standard:



State Building Code only requires that a vent pipe be put in that would allow for an easy and cost effective radon mitigation system. Testing must be done by every homeowner to verify if the radon levels in the home are high.



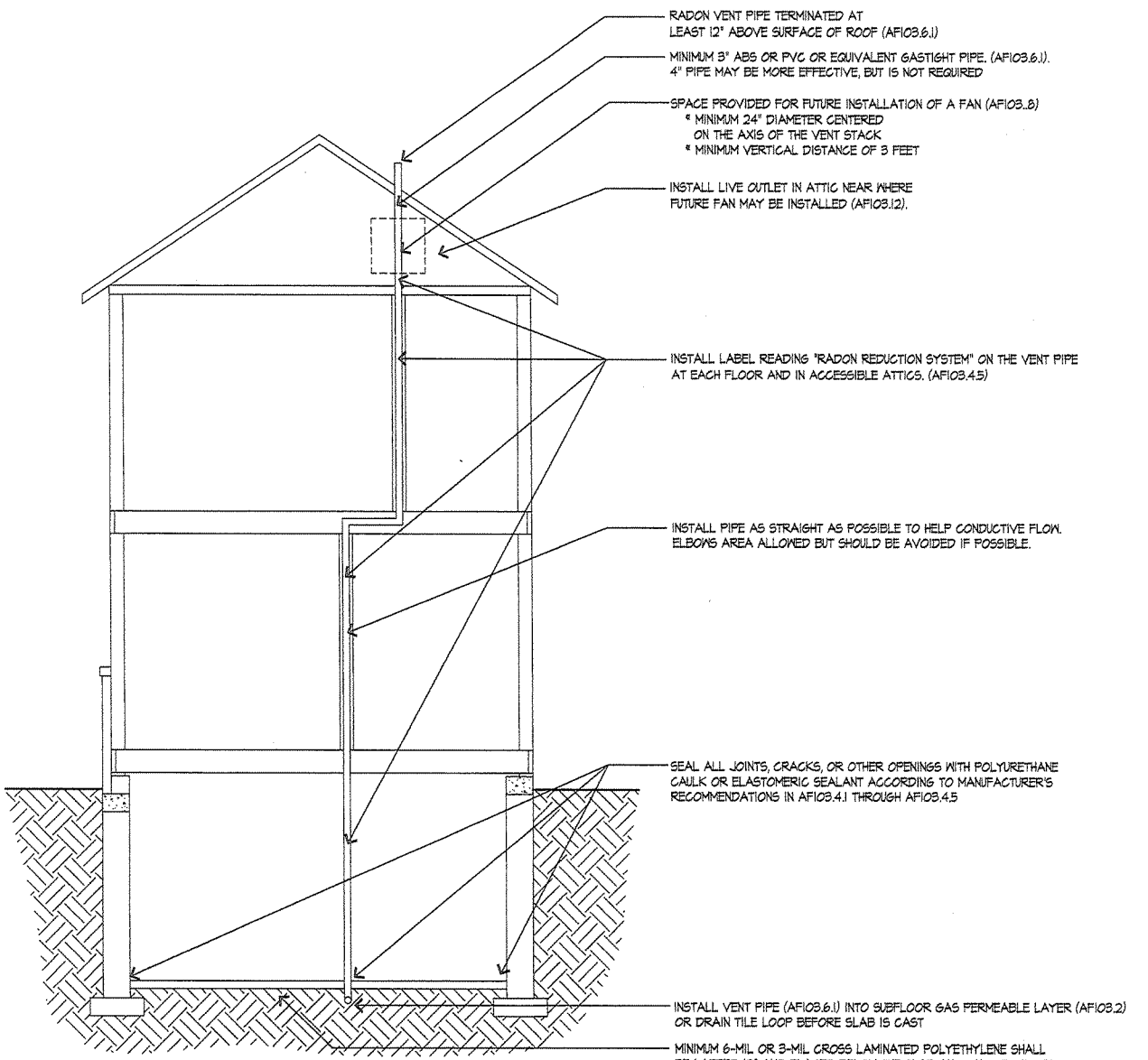
The MDH gold standard requires a full mitigation system to be installed that will not only reduce the radon levels but will reduce the likelihood of other indoor contaminants, that the building code does not consider.

Gold Standard Builder Contact Info:

Passive (Code Minimum) Radon System

APPLIES TO BASEMENTS, CONDITIONED CRAWLSPACES, SLAB-ON-GRADE BUILDINGS AND OTHER FOUNDATIONS UNDER CONDITIONED SPACE

MINIMUM CODE REQUIREMENTS ARE LISTED. OTHER SYSTEM COMPONENTS ARE SUGGESTIONS FOR BEST PRACTICE INSTALLATIONS BASED ON MINNESOTA DEPARTMENT OF HEALTH RECOMMENDATIONS.



THIS ILLUSTRATION DOES NOT REFLECT ALL THE REFERENCES TO ACTUAL CODE LANGUAGE. SEE OTHER SIDE OF THIS SHEET FOR A SUMMARY OF OTHER PASSIVE SYSTEM CODE REQUIREMENTS.

FOR PRECISE REQUIREMENTS AND OPTIONS OF SPECIFIC CODE SECTIONS CHECK THE ORIGINAL CODE LANGUAGE AT www.bam.org/energycode

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BUILDERS ASSOCIATION OF MINNESOTA

The new Residential Energy Code and Radon requirements went into effect for permits pulled on or after June 1, 2009.

The illustration to the left shows the major requirements for passive radon systems in all new residential construction. The back side of this sheet explains additional radon code requirements, recommended upgrades and additional requirements to meet the Minnesota Department of Health's Gold Standard for Radon Resistant New Construction.

BAM has additional free resources to help you understand the new code.

Go to **www.bamn.org/energycode** to:

- Find a link to the Minnesota Department of Health's Gold Standard for Radon Resistant New Construction program
- Download a free copy of the 2009 MN Residential Energy Code, additional illustrations and a *Field Guide to the New Energy Code*
- Ask a question and we'll share it with the entire industry on the energy code Q & A section of our webpage.

This project was made possible by a grant from the U.S. Department of Energy and the Minnesota Department of Commerce with assistance from the Minnesota Department of Health.

For More Information:
www.bamn.org/energycode
800-654-7783 x166 or 651-646-7959 x166

ADDITIONAL PASSIVE RADON SYSTEM COMPONENTS (not shown on illustration on other side of this page)

	Minnesota energy code minimum	Recommended Upgrade	Minnesota Dept of Health Gold Standard for Radon Resistant New Construction requirements
Size of vent pipe	At least 3" gastight ABS or PVC pipe (AF103.6.1)	4" minimum pipe. Makes passive systems more likely to have a convective draw. Allows active system to operate with less powerful fan.	3" minimum for active system
Layout of radon pipe	Not addressed	Straighter pipe layout in passive systems more likely to have a convective draw. Straighter pipe allows active system to operate with less powerful fan.	Fan must be chosen based on MDH pressure extension and fan curve characteristics. (Usually a 20 watt fan works)
Number of elbows allowed in pipe	Not addressed	Straight pipes are highly recommended. Up to two (2) 90 degree elbows in passive systems. Up to six (6) 90 degree elbows in active systems. Horizontal runs should be elimiated if possible, and kept to a minimum, if used.	Up to six (6) 90 degree elbows in required ACTIVE systems. Horizontal runs should be elimiated if possible, and kept to a minimum, if used.
Subslab material	Install a layer of gas permeable material that complies with AF103.2	None	Code minimum is acceptable
Pipe drainage	All pipe components must allow moisture to positively drain beneath the slab or soil-gas-retarder. (AF103.7)	None	Code minimum is acceptable
Foundation walls built of hollow masonry construction	One course above grade must be filled solid to restrict air movement (AF103.4.5)	None	Code minimum is acceptable

ACTIVE RADON SYSTEM COMPONENTS (in addition to those required in passive systems)

	Minnesota energy code minimum	Recommended Upgrade	Minnesota Dept of Health Gold Standard for Radon Resistant New Construction requirements
Pipe insulation	Minimum R-4 when run through unconditioned spaces or exterior walls (AF103.6.1, Exception)	None	3" or 4" pipe may not be run through exterior walls. Must be run through interior walls or interior chase.
Fan requirements	None	Size continously exhausting fan with the smallest cfm that will reduce radon to desired level. Gaskets installed to reduce noise.	Fan must be chosen based on MDH pressure extension and fan curve characteristics. (Usually a 20 watt fan works)
Testing requirements/ Minimum radon reading (pico/L)	Not addressed. Testing is not required by builder or homeowner.	Short term and long term testing with result under 4.0 pico/L. Activate system if pico/L reading is 4.0 or more.	Short term test required before closing. Long-term, one year test deployed at closing. Follow-up occupant testing every two years.
System monitoring device to indicate if fan is drawing air	Required (AF103.6.1, Exception). Manometer is allowed.	None	In additon to a manometer, add a completed Gold Standard checklist on the vent pipe.

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Radon Resistant New Construction (RRNC) Energy Calculations:

Average RRNC Fan*	20 Watts	X	24 hrs	=	480 watt-hours/day
	480 watt-hours/day	X	7 days/wk	=	3360 watt-hours/wk
	3360 watt-hours/wk	÷	1000 watts/kilowatt	=	3.36 kwh/wk
	3.36 kwh/wk	X	$0.07/kwh	=	**$0.24/wk**
	$0.24/wk	X	4.25 wk/mo	=	**$1.02/mo**
	$1.02/mo	X	12 mo/yr	=	**$12.24/yr**

Average Mitigation Fan*	100 Watts	X	24 hrs	=	2400 watt-hours/day
	2400 watt-hours/day	X	7 days/wk	=	16800 watt-hours/wk
	16800 watt-hours/wk	÷	1000 watts/kilowatt	=	16.8 kwh/wk
	16.8 kwh/wk	X	$0.07/kwh	=	**$1.15/wk**
	$1.15/wk	X	4.25 wk/mo	=	**$4.87/mo**
	$4.87/mo	X	12 mo/yr	=	**$58.44/yr**

Average TV with Power OFF	10 Watts	X	24 hrs	=	240 watt-hours/day
	240 watt-hours/day	X	7 days/wk	=	1680 watt-hours/wk
	1680 watt-hours/wk	÷	1000 watts/kilowatt	=	1.68 kwh/wk
	1.68 kwh/wk	X	$0.07/kwh	=	**$0.11/wk**
	$0.11/wk	X	4.25 wk/mo	=	**$0.49/mo**
	$0.49/mo	X	12 mo/yr	=	**$5.84/yr**

Average Computer Left ON	135 Watts	X	24 hrs	=	3240 watt-hours/day
	3240 watt-hours/day	X	7 days/wk	=	22680 watt-hours/wk
	22680 watt-hours/wk	÷	1000 watts/kilowatt	=	22.68 kwh/wk
	22.68 kwh/wk	X	$0.07/kwh	=	**$1.55/wk**
	$1.55/wk	X	4.25 wk/mo	=	**$6.57/mo**
	$6.57/mo	X	12 mo/yr	=	**$78.90/yr**

* The difference in fan size is due to the gravel required in the RRNC building practices.

MINNESOTA MDH DEPARTMENT OF HEALTH

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